

PROJECT NUMBER: 2507
PROJECT TITLE: Radiochemical Investigations
PROJECT LEADER: S. B. Hassam
PERIOD COVERED: July, 1987

I. Mg TRANSFER

A. Objective: To collect and analyze smoke for Mg levels.

B. Results: Filtered cigarettes with wrappers containing 0, 12 and 35% Mg(OH)₂ (5 of each type) were smoked on a total impaction trapping smoking machine. The collected smoke condensates and butts, together with unsmoked cigarettes, were submitted for measurement of Mg by atomic absorption. A comparison of the Mg recovered in smoke vs. that in unsmoked cigarettes showed 99.6% recovery for the control (#3650, 0% Mg(OH)₂), 97.3% for #3652 (12% Mg(OH)₂), and 76.5% for #3654 (35% Mg(OH)₂). The reasons for the lower than expected recovery for #3654 are unclear. Based on total recovered Mg levels in smoke, the % transfer of Mg into sidestream condensate was 0.02% for control, 0.02% for #3652 and 0.04% for #3654. Greater differences were observed for Mg levels in the sidestream material that collects in the dome covering the cigarettes: 0.04% for control, 0.07% for #3652 and 0.22% for #3654.

C. Plans: Continue investigation of low sidestream delivery cigarettes. Measure Mg levels by neutron activation.

D. References: N.B. 8386; R. H. Newman, memo to R. N. Ferguson, "Mg Measurement in Low Sidestream Delivery Cigarettes", July 20, 1987.

II. GAS PHASE ANALYSIS

A. Objective: To develop collection and analysis procedures for sidestream gas phase analysis.

B. Results: Gas chromatography analysis of CO/CO₂ ratios in sidestream and mainstream gas phases of unfiltered cigarettes with and without Mg(OH)₂-added papers was continued. Five cigarettes of each type from packs #3657, 3659 and 3661 were smoked. A summary of the instrumentation, smoking experiments and results is being prepared.

C. Plans: Continue analysis of low sidestream delivery cigarettes. Continue development and improvement of the current method of analysis.

D. References: N.B. 8154

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III. INFRARED CAMERA

- A. Objective:** Measure temperature distributions in cigarette coals and develop computer programs for data analysis.
- B. Results:** A program to extract temperature *vs.* area information from the infrared camera images has been completed. Using this program infrared red images of cigarettes with $Mg(OH)_2$ -added wrappers were analyzed. A large variation in the temperature *vs.* area was observed for (1) the same cigarette at different times and (2) different cigarettes at the same charline position. These variations may reflect dynamic processes occurring during smoulder which is usually thought of as a steady state process with little temporal diversity.
- C. Plans:** Complete calibration programs. Increase the number of smoking runs to improve sample comparisons. Develop techniques to investigate further dynamic aspects of the smoulder process.
- D. References:** N.B. 8481; D. Leister, memo to D. McRae, June 4, 1987; D. Leister, memo to D. McRae, June 11, 1987; D. McRae and D. Leister, memo to R. Ferguson, June 15, 1987; D. Leister, memo to D. McRae, June 29, 1987.

IV. SMOKE CHEMISTRY STUDIES**A. Objective:**

- 1. Compare total smoke distribution from ^{14}C -octatriacontane-labeled cigarettes with and without $Mg(OH)_2$ -added wrappers.
- 2. Analyze smoke components from ^{14}C -octatriacontane-labeled cigarettes by high performance liquid radiochromatography (HPLRC).
- 3. Synthesize ^{14}C -labeled n-henhexacontane, $n-C_{61}H_{124}$, for use as a model compound in smoke transfer studies.

B. Results:

- 1. Data analysis is in progress.
- 2. HPLRC of ^{14}C -labeled smoke components has been completed and data analysis is in progress.
- 3. The key step of a proposed synthetic route was performed using unlabeled materials. Specifically tosylmethyl isocyanide was alkylated with 1-iodotriacontane. The resulting product was analyzed by 1H NMR, FTIR and EI/MS and concluded to be the desired intermediate 31-isocyano-31-tosyl-henhexacontane. Hydrolysis of this product gave the ketone 31-henhexacontanone, the precursor to $n-C_{61}H_{124}$.

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C. Plans:

1. Continue smoke distribution studies of radiolabeled cigarettes.
2. Perform radiochromatography analyses as needed.
3. Continue investigation of the synthetic route.

D. References: N.B. 8386; N.B. 8487; memo from S. B. Hassam to R. N. Ferguson, "Synthesis of Radiolabeled n-Henhexacontane, C₆₁H₁₂₄", July 3, 1987.

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